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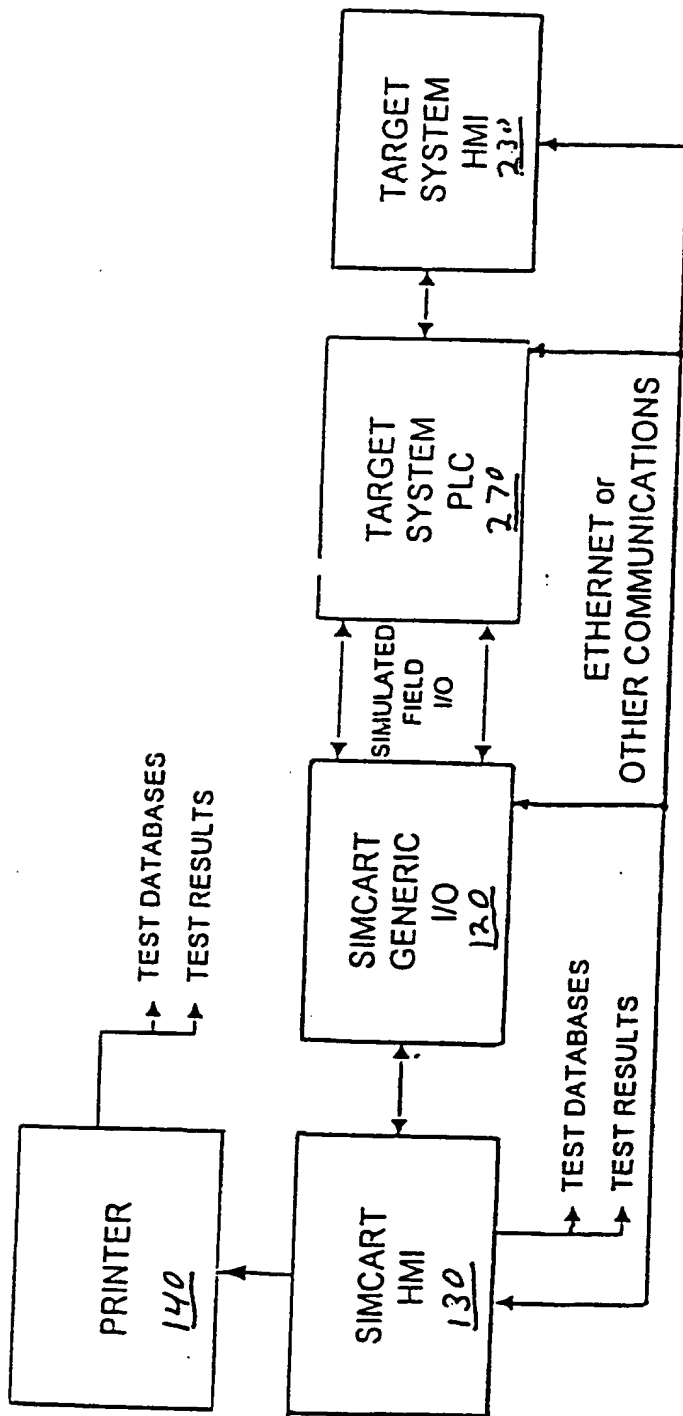


Figure 2

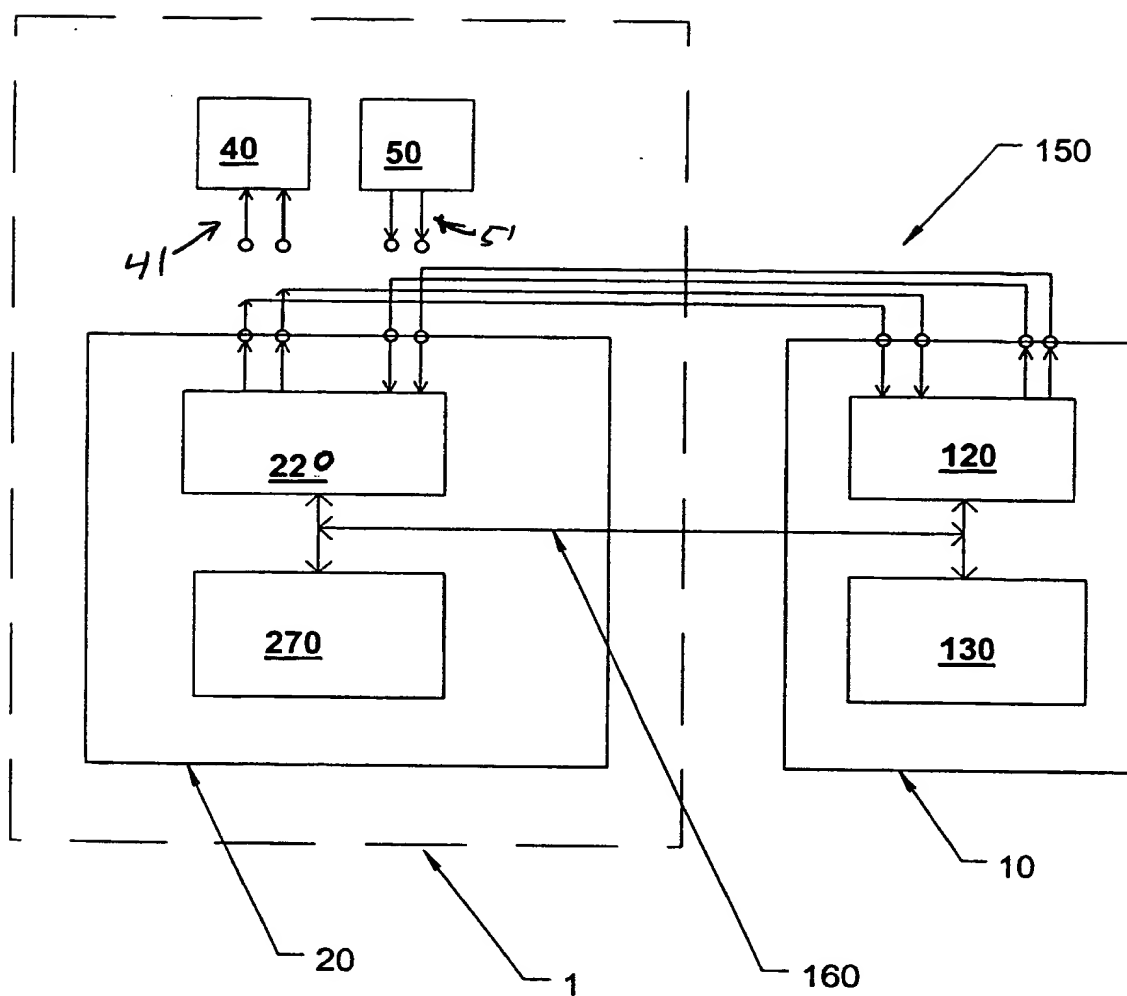
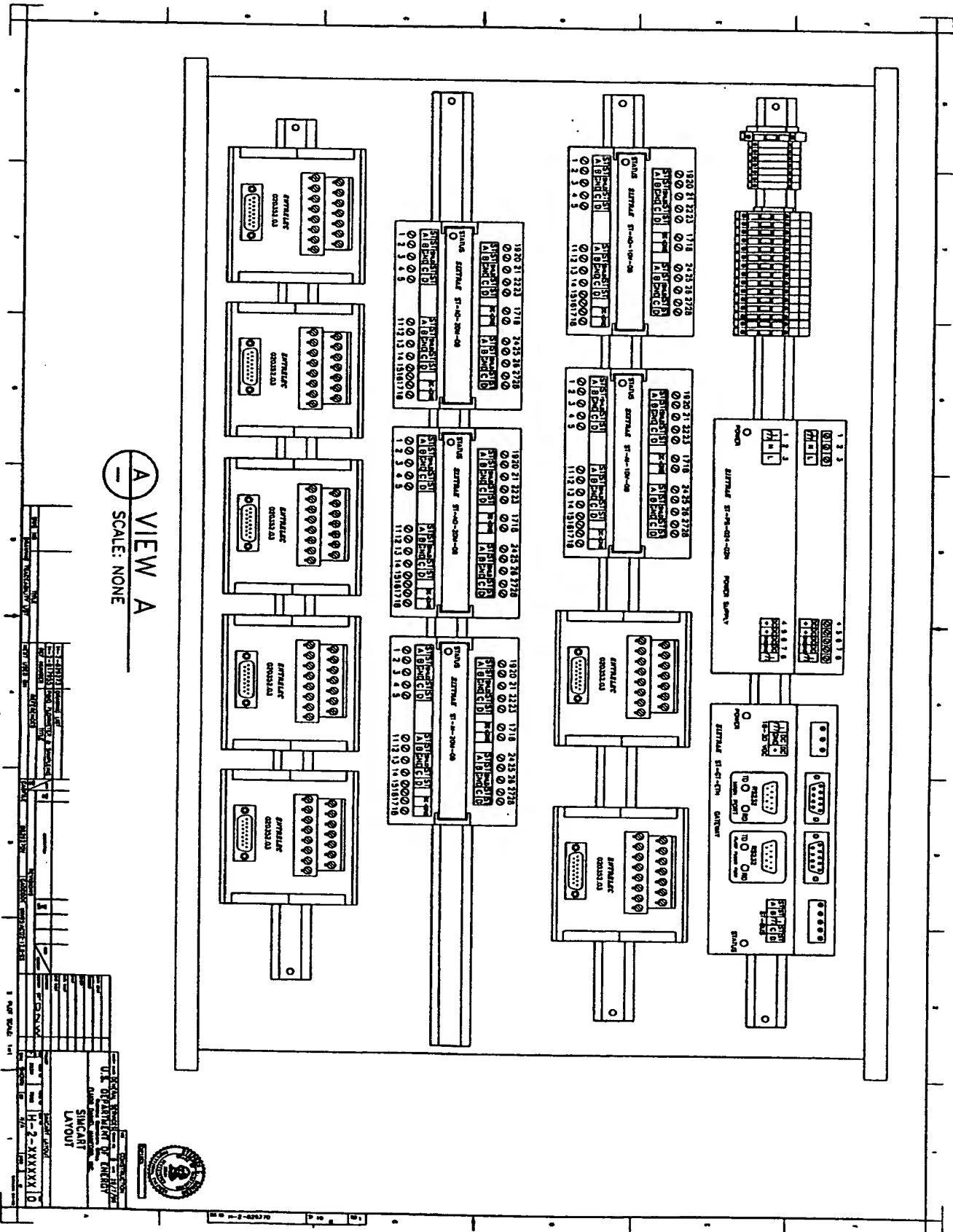


FIG. 3

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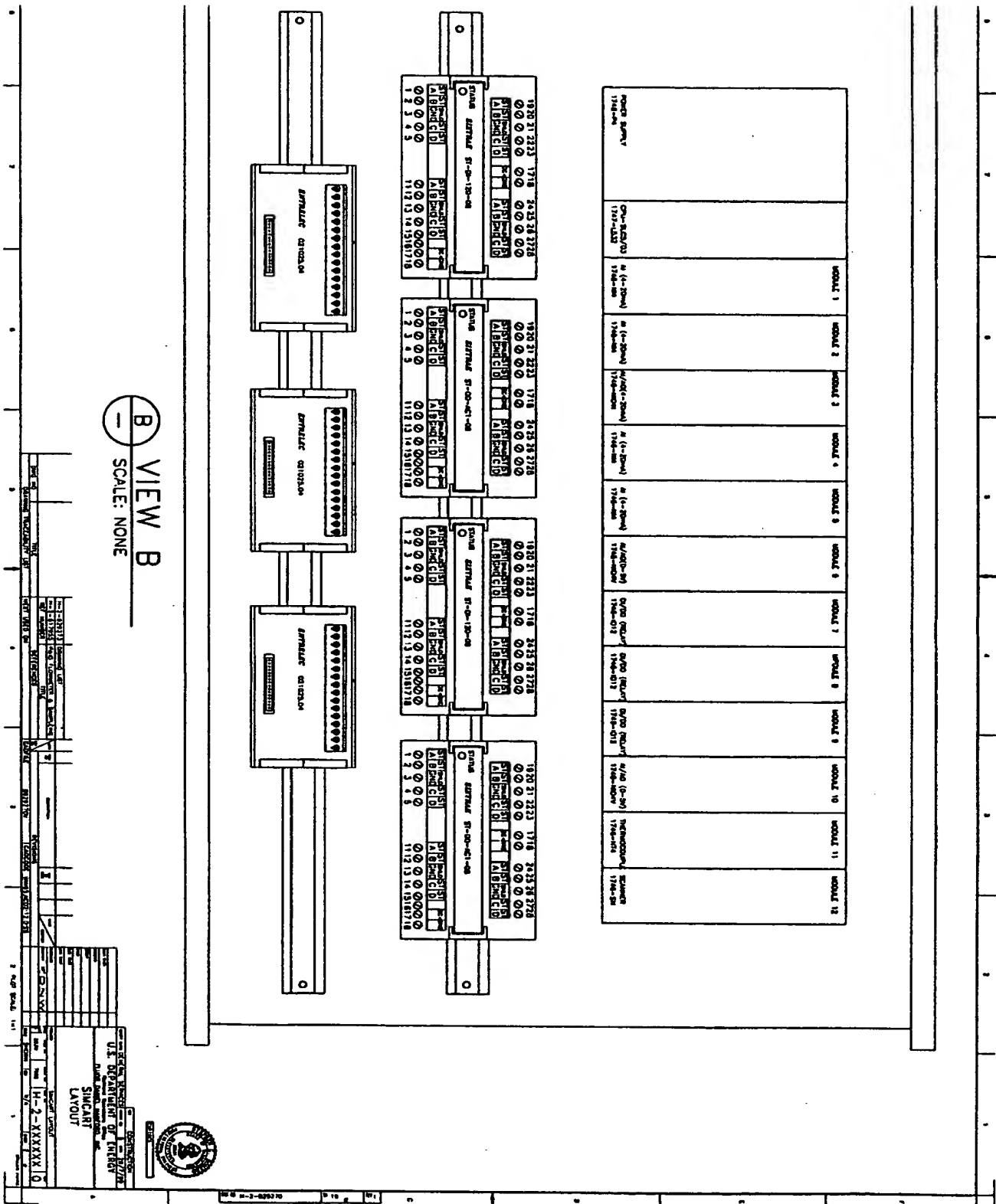
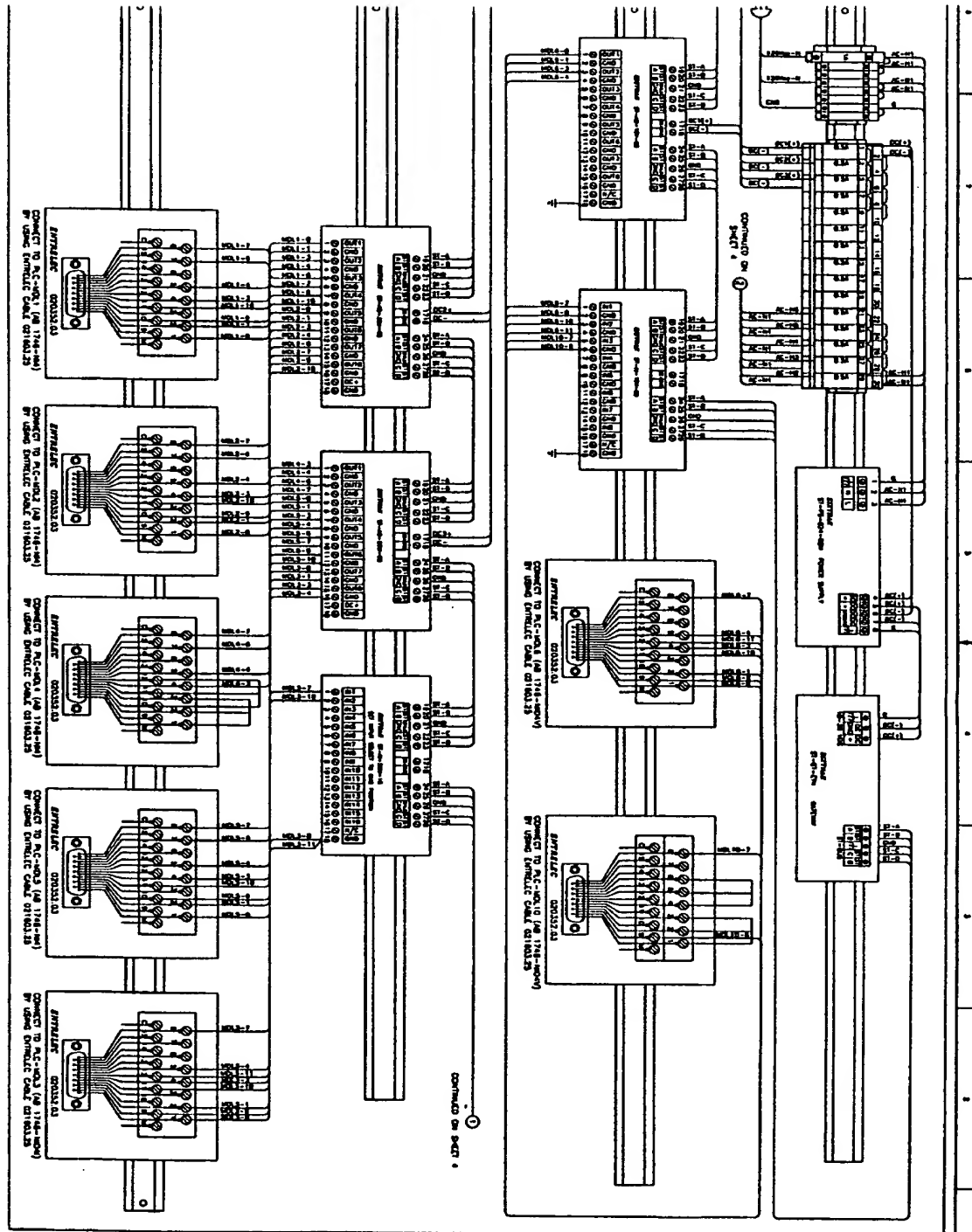


Fig 4B

# WIRING CONNECTIONS

SCALE NONE



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U.K. DEPARTMENT OF ENERGY  
SINGART  
WIRING CONNECTION

F, 5A

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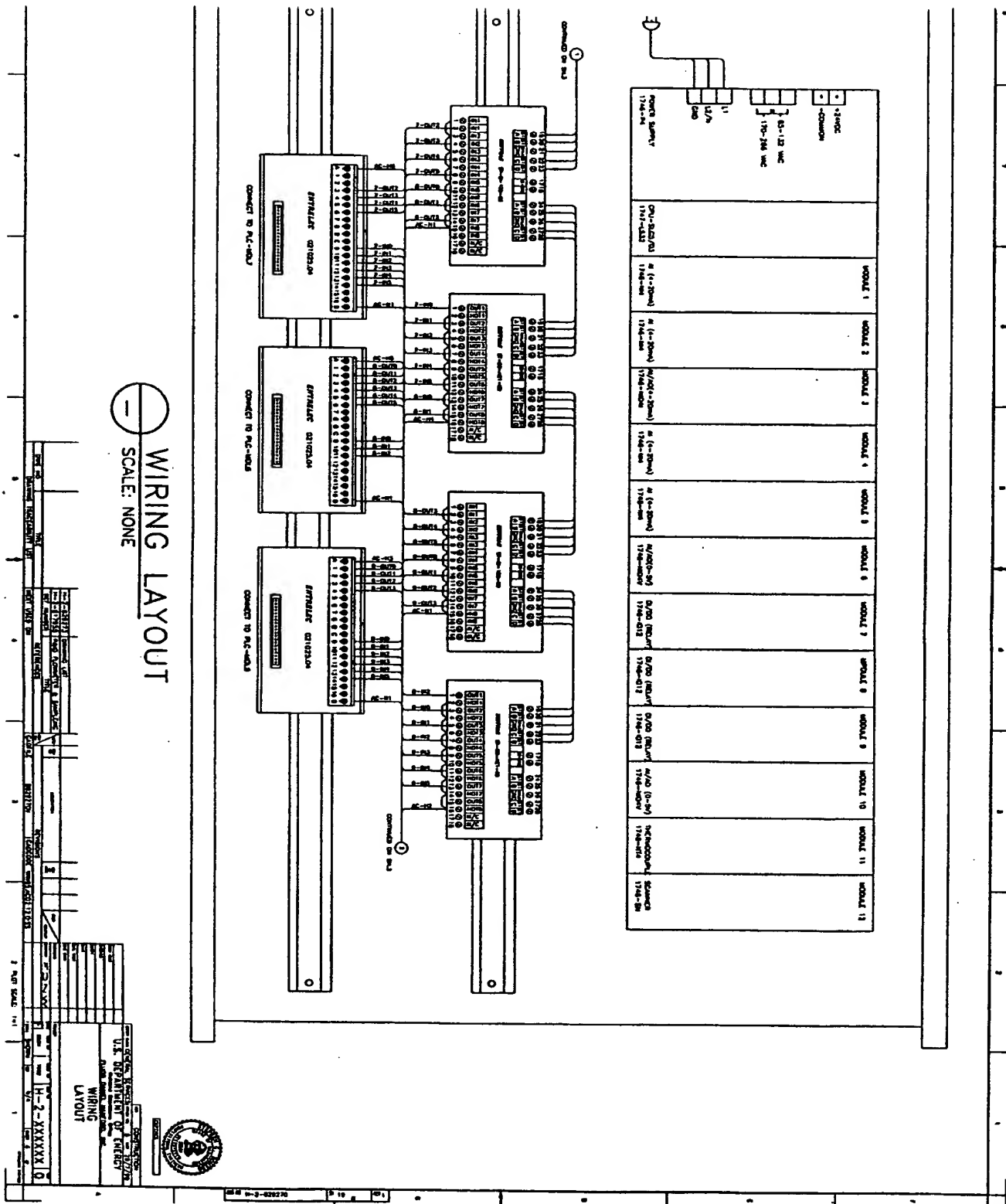
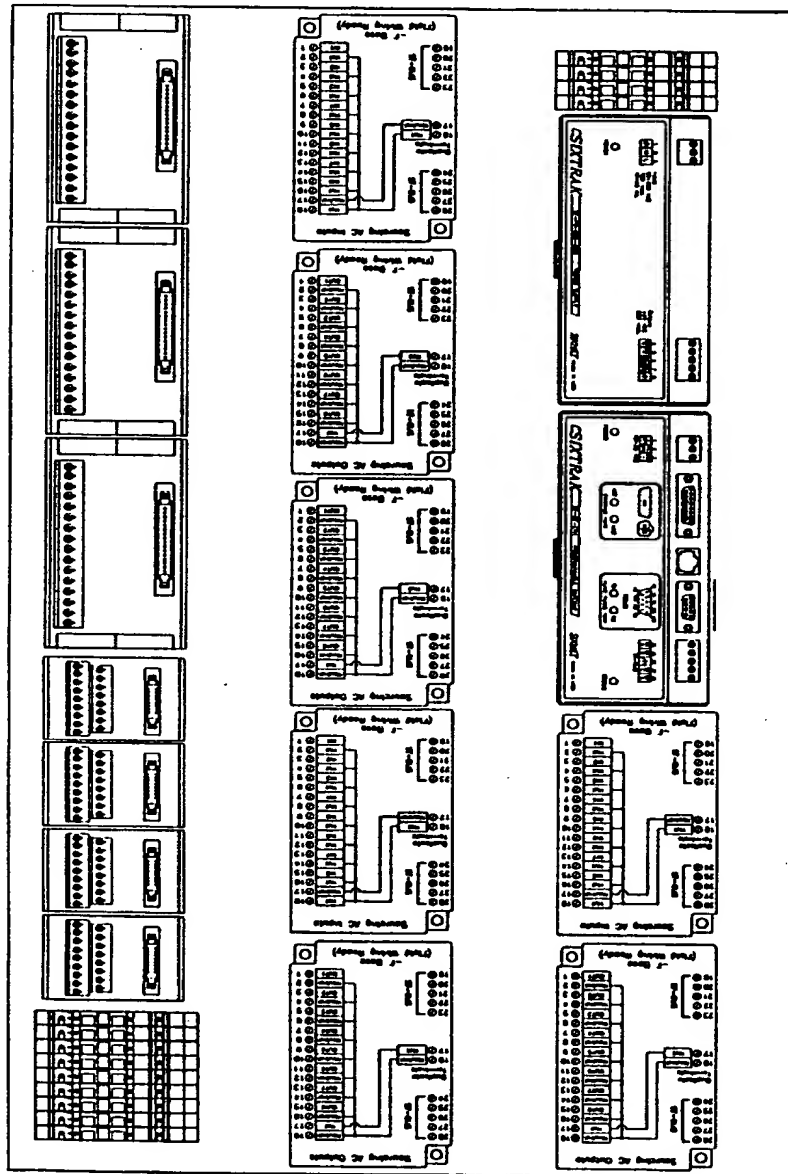


Fig 5B



U.S. DEPARTMENT OF ENERGY  
SIMCAGE LAYOUT

Fig 6

0936080-034202



100-427827-10

**SIMCart™**

Partially complete procedure: Select Starting Test Step

<START FROM BEGINNING>

- 1 I: Select PID test from test Q: Was the test successfully
- 2 I: Select Totalizer test fro Q: Was the test successfully
- 3 I: Select Indication test fr Q: Was the test successfully
- 4 I: Select Indication test fr Q: Was the test successfully

**RUN TEST**

**CANCEL**

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SIMCart™

Running Test...

Step 3.1

Select PID test from test module menu. Run test for FIC\_2001\_01.

DONE

Was the test successfully completed?

YES NO

COMMENT

PREV STEP CURR STEP NEXT STEP

1 01 8

Debug Reset Bit Set Bit CANCEL CLOSE

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**SIMCart™**

Running Test...

Step 3.1

Select PID test from test module menu.  
Run test for FIC\_2001\_01.

DONE

Was the test successfully  
completed?

YES

COMMENT

NO

PREV STEP

CURR STEP

OF

NEXT STEP

Debug

Reset Bit

Set Bit

CANCEL

CLOSE

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Fig 10



**SIMCart™**

Running Test...

Step 32

Select Totalizer test from test module menu: Run test for FQIT\_2001\_01.

DONE

Was the test successfully completed?

YES COMMENT NO

PREV STEP CURR STEP 2 OF 8 NEXT STEP

Debug Reset Bit Set Bit CANCEL CLOSE

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H<sub>1</sub>

TagName	Initial	LL_Limit	L_Limit	H_Limit	HH_Limit	Deadband
PT_2001_01	1				59.00	
PT_2001_02	1			40.00	42.00	
PT_2001_03	1	15.00			30.00	

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F<sub>1</sub>, r<sub>2</sub>

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Alarm G

Alm_Ind	QNum	Type	Question
A1	1	H	Did the analog display symbol flash RED on screen?
A1	1	H_DB	Is the alarm still active?
A1	1	H_RTN	Did the HIGH level alarm clear?
D1	1	Dig	Did the alarm activate?
D1	1	Dig_RTN	Did the alarm reset?
A1	1	L	Did the analog display symbol flash RED on screen?
A1	1	L_DB	Is the alarm still active?
A1	1	L_RTN	Did the LOW level alarm clear?
A1	2	H	Did the menu button for the display screen flash?
A1	2	L	Did the menu button for the display screen flash?
A1	3	H	Did the alarm text appear on "CURRENT ALARMS"?
A1	4	H	Did the SCADA Alarm paging system receive the alarm? (F12 for System

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ID	TagName	Description	EUZero	EUMax	Eunit
AIT_2001_01	Column Exit	2	12		pH
AIT_2001_02	Column Exit	0	200		mmho
AIT_2001_03	Column Exit	0	30		AU
AIT_2001_04	Column Inlet	0	30		AU
AIT_2001_05	Column Inlet	2	12		pH
AIT_2001_06	Column Inlet	0	200		mmho
PT_2001_01	Filter Inlet	0	60		psig
PT_2001_02	Column Inlet	0	60		psig
PT_2001_03	Column Exit	0	60		psig
TT_2001_01	Feed	0	50		deg C
TT_2001_02	Column Exit	0	50		deg C

Fis 14

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PID Loop

PID_Number	Loop_Desc	Process_TagName	Min_EU	Max_EU	EU_Name	SetPoint_TagName	Control
1	Controls filter	dP_2001_02	0	5	V	PT_2001_02	dPC_20
2		FIT_2001_01	0	15	L/min	FIC_2001_01SP	FIC_20

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Section 10

ID	SectionNum	SectionStep	Instruction	
	2	20	Click on "Test" button and select tag name XV_2001_105_ZCO and read	V
	2	21	From HMI open valve 106.	
	2	22	Click on "Test" button and select tag name XV_2001_106_ZCO and read	V
	2	23	From HMI close valve 106.	
	2	24	Click on "Test" button and select tag name XV_2001_106_ZCO and read	V
	2	25	From HMI open valve 107.	
	2	26	Click on "Test" button and select tag name XV_2001_107_ZCO and read	V
	2	27	From HMI close valve 107.	
	2	28	Click on "Test" button and select tag name XV_2001_107_ZCO and read	V
	2	29	From HMI open valve 108.	
	2	30	Click on "Test" button and select tag name XV_2001_108_ZCO and read	V
	2	31	From HMI close valve 108.	
	2	32	Click on "Test" button and select tag name XV_2001_108_ZCO and read	V
	2	33	From HMI open valve 109.	
	2	34	Click on "Test" button and select tag name XV_2001_109_ZCO and read	V
	2	35	From HMI close valve 109.	
	2	36	Click on "Test" button and select tag name XV_2001_109_ZCO and read	V
	2	37	From HMI open valve 110.	
	2	38	Click on "Test" button and select tag name XV_2001_110_ZCO and read	V
	2	39	From HMI close valve 110.	
	1	1	Instauction 1	Q
	2	1	From HMI open valve 101.	
	2	2	Click on "Test" button and select tag name XV_2001_101_ZCO and read	V
	2	3	From HMI close valve 101.	
	2	4	Click on "Test" button and select tag name XV_2001_101_ZCO and read	V
	2	5	From HMI open valve 102.	
	2	6	Click on "Test" button and select tag name XV_2001_102_ZCO and read	V
	2	7	From HMI close valve 102.	
	2	8	Click on "Test" button and select tag name XV_2001_102_ZCO and read	V
	2	9	From HMI open valve 103.	
	2	10	Click on "Test" button and select tag name XV_2001_103_ZCO and read	V
	2	11	From HMI close valve 103.	
	2	12	Click on "Test" button and select tag name XV_2001_103_ZCO and read	V
	2	13	From HMI open valve 104.	
	2	14	Click on "Test" button and select tag name XV_2001_104_ZCO and read	V
	2	15	From HMI close valve 104.	
	2	16	Click on "Test" button and select tag name XV_2001_104_ZCO and read	V
	2	17	From HMI open valve 105.	
	2	18	Click on "Test" button and select tag name XV_2001_105_ZCO and read	V
	2	19	From HMI close valve 105.	
	2	40	Click on "Test" button and select tag name XV_2001_110_ZCO and read	V
	3	1	Select PID t st from test module menu. Run test for FQIT_2001_01.	V
	3	2	Select Totalizer test from test module menu. Run test for FQIT_2001_01.	V
	3	3	Select Indication test from test module menu. Run test for FQIT_2001_01.	V
	3	4	Select Indication test from test module m nu. Run test for TT_2001_01.	V
	3	5	Select Indication test from test module menu. Run t st for PT_2001_01.	V

Fig 16

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Section  
List

Num.	Name
1	General
2	Input Manifold
3	Filtration
4	Column
5	Output

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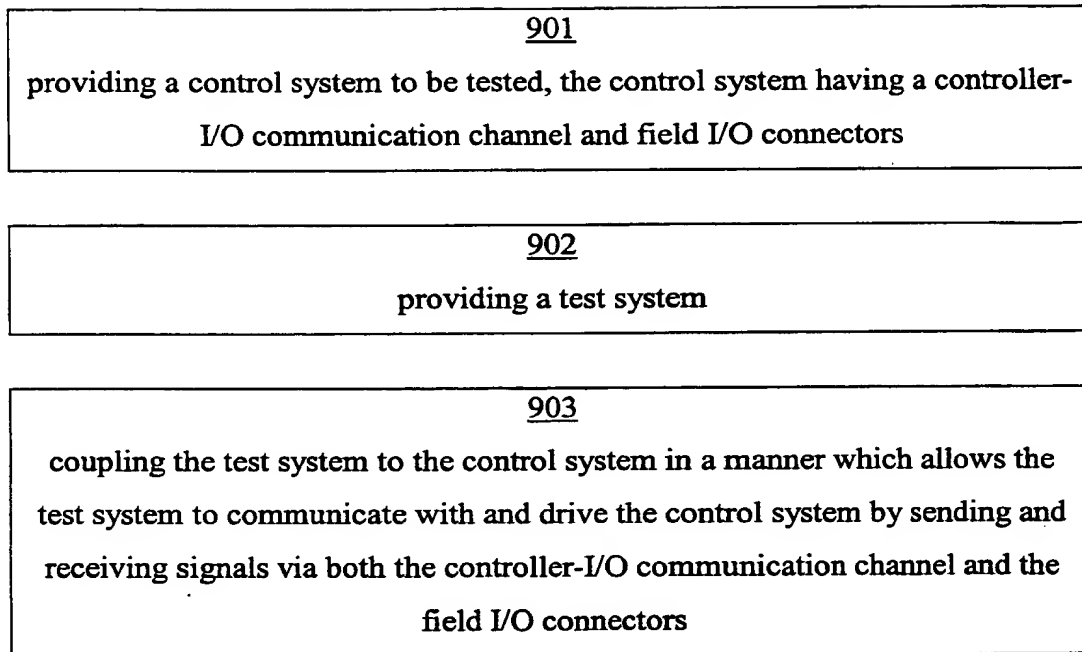
Fig 17

Sgs R-23

ID	Section	Requirement	Question
	G.1		1 Security requirements related to hardware:
	G.1		2 Login requirements:
	G.1.2		1 Password protection required (Yes/No):
	G.1.2		2 Protection areas:
	G.1.2		3 Number of security levels:
	G.1.2		4 Security level names:
	G.1.2		5 Configurable levels (Yes/No):
	G.1.2		6 What can be configured?
	G.1.2		7 System restrictions:
	G.1.2		8 Other login requirements:
	G.2		1 PLC Specifications:
	G.2.1		1 Brand of PLC used:
	G.2.1		2 Type of PLC used:
	G.2.1		3 PLC quantity:
	G.2		2 Operating Conditions
	G.2.2		1 Ambient operating temperature range:
	G.2.2		2 Relative humidity range:
	G.2.2		3 RFI requirements:
	G.2.2		4 Other operating condition requirements:
	G.2		3 Hardware Requirements:
	G.2.3		1 Mounting requirements:
	G.2.3		2 Control network type:
	G.2.3		3 Access ports:
	G.2.3		4 I/O Network port required? (Yes/No)
	G.2.3		5 Other hardware requirements:
	G.2		4 PLC programming software:
	G.2		5 Electrical Specifications:
	G.2.5		1 Power supply:
	G.2.5		2 Electrical isolation requirements:
	G.2.5		3 Wiring requirements:
	G.2.5		4 Other electrical requirements:
	G.2		6 PLC Alarms:
	G.2.6		1 Hardware alarms:
	G.2.6		2 Software alarms:
	G.2.6		3 LED indications for diagnostic points required?
	G.2.6		4 Other PLC Alarms:
	G.2		7 Other PLC specific requirements:
	G.3		1 PC Specifications:
	G.3.1		1 Will a PC be used? (Yes/No)
	G.3.1		2 PC manufacturer preference:
	G.3.1		3 PC type (e.g., Tower, Desktop, etc.):
	G.3.1		4 PC processor type:
	G.3.1		5 RAM (MB) required:
	G.3.1		6 Number of PCs required:
	G.3		2 Laptop Specifications:
	G.3.2		1 Will a laptop be used? (Yes/No)

Fig 18

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**Fig. 19**

901

providing a control system to be tested, the control system having a controller-I/O communication channel and field I/O connectors

902

providing a test system

903

coupling the test system to the control system in a manner which allows the test system to communicate with and drive the control system by sending and receiving signals via both the controller-I/O communication channel and the field I/O connectors

904

decoupling the test system from the control system

905

installing the control system in a plant to be controlled

906

utilizing at least a portion of the test system to validate the operation of the control system

**Fig. 20**

901

providing a control system to be tested, the control system having a controller-I/O communication channel and field I/O connectors

902

providing a test system

903

coupling the test system to the control system in a manner which allows the test system to communicate with and drive the control system by sending and receiving signals via both the controller-I/O communication channel and the field I/O connectors

904

decoupling the test system from the control system

905

installing the control system in a plant to be controlled

906b

utilizing at least a portion of the test system to validate the operation of the control system by coupling an I/O portion of the test system in place of at least some of the plant's sensors and actuators

**Fig. 21**

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901

providing a control system to be tested, the control system having a controller-I/O communication channel and field I/O connectors

902

providing a test system

903

coupling the test system to the control system in a manner which allows the test system to communicate with and drive the control system by sending and receiving signals via both the controller-I/O communication channel and the field I/O connectors

904

decoupling the test system from the control system

905

installing the control system in a plant to be controlled

906c

utilizing at least a portion of the test system to validate the operation of the control system by having the test system provide instructions and questions to one or more plant operators thereby instructing them to perform various operations and prompting them to enter a description as to how the control system responded to the operations, and recording any operator entered descriptions to any questions asked

causing the test system to generate a report indicating which operations where performed, and what the control system response was for any operations performed

**Fig. 22**



911

providing a plant control system to be tested, the control system comprising a controller, an I/O interface, a sensor input port, an actuator output port, a series of communication segments communicatively coupling the sensor input port to the controller such that an input signal applied to the sensor input results in one or more signals traveling along each of the communication segments so as to notify the controller of the applied input signal, and a series of communication segments communicatively coupling the controller to the actuator output port such that a control signal generated by the controller results in an output signal being applied to the actuator output port

912

providing a simulator, the simulator coupled to the control system at at least three points, wherein a first point is the sensor input port, a second point is a controller-I/O interface network access point from which data relating to the internal state of the controller can be obtained, and a third point is the actuator output port

913

causing the simulator to apply a signal to the first point and to subsequently obtain data on the internal state of the controller and to monitor the actuator output port for any applied signals

**Fig. 23**

921

providing a plant control system to be tested, the control system comprising a controller, a sensor, an actuator, and an I/O interface having a sensor input port and an actuator output port wherein the I/O interface and controller are networked together, the sensor is electrically coupled to the sensor input port, and the actuator is electrically coupled to the actuator output port

922

disconnecting the sensor and actuator from the sensor input port and actuator output port

923

providing a simulator

924

networking the simulator with the controller and the I/O interface and coupling the simulator to the sensor input port and the actuator output port

925

causing the simulator to transmit a signal to the controller via the sensor input port while monitoring signals transmitted by the controller to the actuator port

926

determining any changes in state in the controller caused by the transmitted signal

**Fig. 24**

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931

providing a control system to be tested

932

providing simulated sensor inputs to the control system

933

monitoring the control systems response to the simulated sensor inputs by both  
monitoring the control system's actuator outputs and querying the controller for  
information on its internal state

**Fig. 25**

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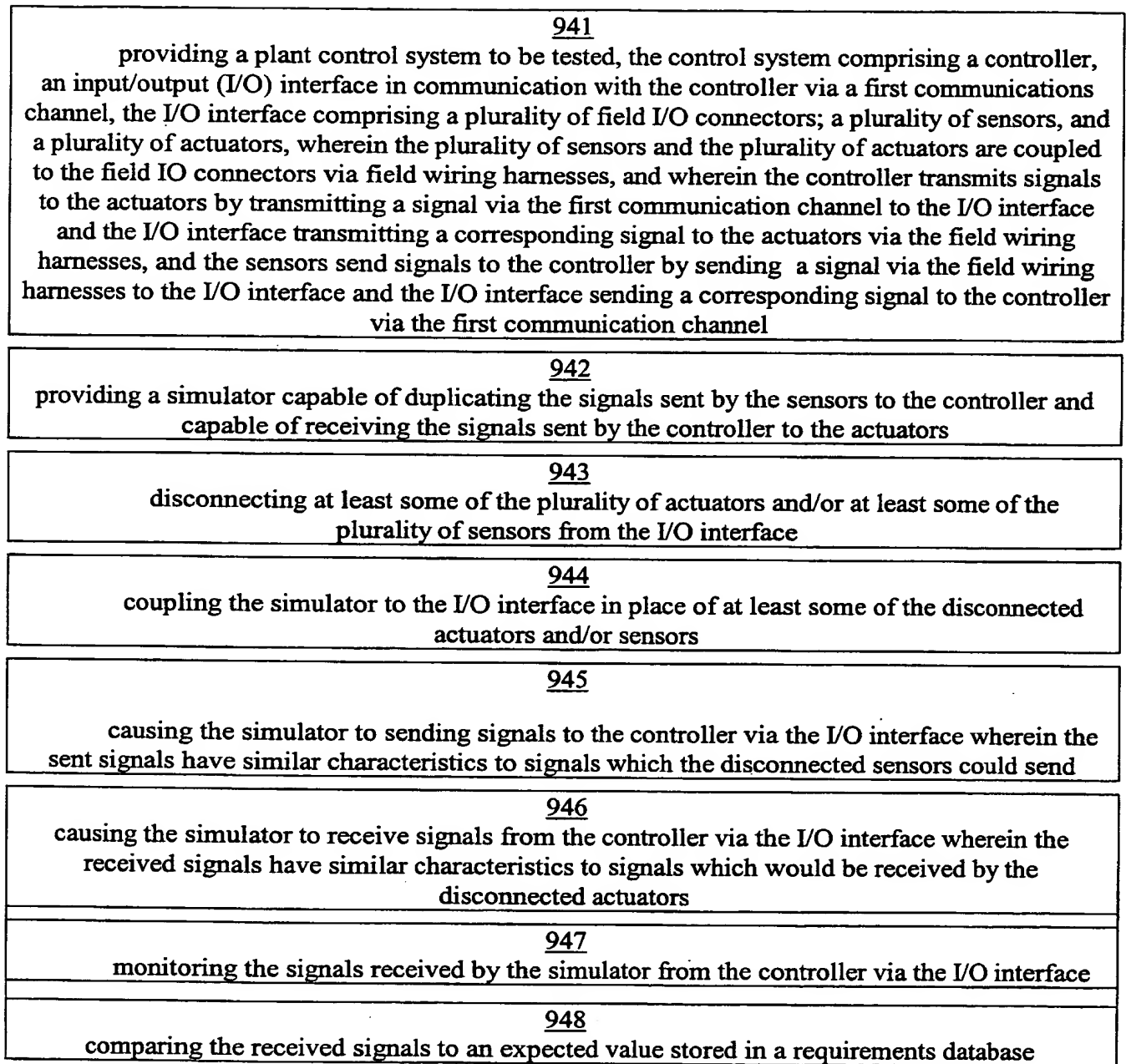


Fig. 26